

# North Carolina Statewide Technical Architecture

## Platform Domain

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## **1. Principles:**

### **1.1. Limit the variation of original equipment manufacturer (OEM) platform solutions.**

Rationale:

- Using multiple servers from the same vendor with the same operating system release is cost effective because a group of uniform servers is easier to manage and integrate across a wide geographic area and multiple agencies.
- A highly granular, loosely-coupled server design supports modular application code sets in an N-Tiered application architecture.
- Limiting platform variation with a loosely coupled server design supports a modular approach to solution design and management.
- Agencies can focus staff skills development within minor variations to maximize limited resources and enable staff to maintain advanced levels of knowledge in specific technologies rather than minimal levels of knowledge in broad technology choices.

### **1.2. Design mission critical systems without a single point of failure.**

Rationale:

- Distributed systems can be designed to be extremely robust.
- Small granular servers make it easier to replicate services for increased availability.
- Systems should be designed to permit continued operations, albeit at reduced throughput, when a server fails in normal operations or in the event of a disaster.

### **1.3. Design all servers implementing a particular application, application suite, or tier within an application with binary compatibility.**

Rationale:

- With binary compatibility, there would be no need to recompile an application for different platforms. For example, if an application that is going to be deployed on servers located in employment security offices all servers running that application should be binary compatible -- this must be ensured even if the platforms are from the same manufacturer. The platforms must run the same version of the operating system and must not require any recompilation of the line of business application to deploy from one office to another.
- Total binary compatibility will support automated software distribution across servers and associated strategies which reduce support costs and provide stable computing platforms that can be reliably shared across agencies.

### **1.4. Utilize open, vendor-neutral systems standards, whenever possible.**

Rationale:

- Open, vendor-neutral system standards provide flexibility and consistency that will allow agencies to respond more quickly in an environment of changing business requirements.
- Vendor-neutral systems support economic and implementation flexibility.
- Vendor-neutral systems also protect the state against unexpected changes in vendor strategies and capabilities.

### **1.5. Design servers to allow multi-tasking and multi-threading.**

Rationale:

- Multi-tasking achieves better CPU utilization.
- Multi-threaded processing enable a server to respond to multiple user requests more efficiently.
- These features also facilitate session management. Fewer sessions to manage provides a more scaleable solution. Multi-threading usually provides capability to execute more sessions ie, more users can run the same application simultaneously, or several threads of the same application can run simultaneously. The ability to run more session or threads would demonstrate a more scaleable solution.

### **1.6. Design servers to be field upgradeable.**

Rationale:

- Rapid changes in business processes are enabled in part by implementing a platform technical infrastructure that exceeds the immediate application requirements. This means agencies should purchase servers with larger chassis so they are able to be expanded more easily and cost effectively.
- Field upgradeable servers provide maximum flexibility and adaptability for growth and new functionality

### **1.7. Make platform decisions based on long-term business needs.**

Rationale:

- Picking a platform to run a specific purchased application to meet a specific business need may not support long-term state and local agency requirements. In addition, investment in short-term solutions that do not migrate easily to a strategic platform can ultimately be more costly and time consuming than investing in a strategic platform initially.
- Cooperative efforts among agencies and local government to cross-utilize platform incorporating the state's recommended platform technology components may provide the most cost-effective solution. File and print servers, for example, can easily be implemented as shared resources.

## **2. Technical Topic: Server Platform**

### **2.1. Practices:**

**2.1.1. Run mid-range application and database servers on a 32-bit multi-tasking, multi-threaded operating system, at a minimum.**

Rationale:

- Migration from 16-bit operating system platforms to 32- or 64-bit operating system platforms will support faster processing, access to more memory, and better memory and process management.
- In an N-tiered client/server environment, speed, memory capacity, and memory and process management become increasingly important as processing is distributed across platforms.
- The 32- and 64-bit operating systems provide more stable, reliable platforms in an N-tiered, distributed client/server environment.

**2.1.2. For reliability and ease of support, place each major application on a uniformly configured server.**

Rationale:

- Use the same reference configuration of these servers. Important items to consider when planning for consistency include using the same versions of network software, using the same network hardware cards, etc.
- Tuning performance through configuration changes can make overall maintenance more difficult. In the long run, it may be less expensive to buy more powerful hardware than it is to spend time on individualized tuning and maintenance.
- The Network Operating System should be considered a major application and run on its own platform.

**2.1.3. Consider normal anticipated future application growth when determining capacity requirements for server platforms.**

Rationale:

- A server platform should be purchased that will accommodate the current demand as well as support anticipated normal growth without requiring the purchase of a new server chassis.
- Rather than purchase a fully configured server, purchase the next larger size platform to allow for expansion. This will permit upgrades to an existing platform to accommodate growth rather than forcing the purchase of another machine.

**2.1.4. Balance business adaptability and ease of systems management with server platform choices. However, when there is a conflict between business adaptability and ease of systems management, the business requirements should have highest priority.**

Rationale:

- These two goals will always be in conflict.
- The primary design point of the technical architecture is to provide for change in business operations and its supporting applications. Therefore, even though it is easier to manage a large server rather than multiple smaller servers, the business need to provide flexibility should take precedence over any marginal increases in operational costs.

**2.1.5. Document server operating system configuration.**

Rationale:

- Documenting the set of services and applications installed on a server will help ensure consistency and accuracy of configuration
- An installation plan will make it easier for system administrators to maintain secure configuration and help quickly identify security problems.
- Documenting the hosting environment is integral to business continuity planning.

**2.1.6. Initial operating system must be conducted in a physically controlled environment.**

Rationale:

- A physically secure environment will minimize exposure to attack and other undersired activity. Installation is one of the more vulnerable points for systems; they have not yet been properly hardened to protect against attack and other undersable activity. Additionally, a physically secure environment will allow access only to those system administrators authorized to install and configure the server.

**2.1.7. Install an operating system on servers attached to a network, only if the network is isolated from all other networks during installation.**

Rationale:

- A disconnected network will minimize exposure to attack and other undesired activity. Additionally, a disconnected network will allow access only to those system administrators authorized to install and configure the server.

**2.1.8. Maintain operating system versions to n-1: the most recent major release (n) or at least to the last previously major revision (-1).**

Rationale:

- Limiting operating system version installation to the most major release will help ensure vendor support for the operating system.
- New enterprise applications are built for installation with the most recent major release.

**2.1.9. Enable only those operating system services required for the application or system to functionas designed.**

Rationale:

- Disabling unnecessary services will increase server performance.
- An operating system that has unnecessary services activities increases the risk to security vulnerabilities.

**2.1.10. Miminize server operating system configuration variations.**

Rationale:

- Limiting operating system configurations, through standardization, reduces support and maintenance costs.
- Limiting operating system configuration reduces risk of leaving unnecessary services operational, thus increasing security by decreasing the risk of explotation.

- For example: Web servers dedicated to a specific web-based application should have standardized configuration. The standard configuration, along with any deviations should be thoroughly documented.

#### **2.1.11. Configure all servers supporting mission critical applications, including desktop applications, to minimize service interruption.**

Rationale:

- Select a computer constructed to perform as a highly available, highly reliable, fault tolerant server with such features as redundant disk arrays, network cards, power supplies, and processors.
- Select a server with sufficient growth capacity to accommodate the anticipated increase in application requirements over time.
- Formalize security, disaster recovery, and backup procedures to ensure the integrity of both the server and the application. Test those practices on a regularly scheduled basis.

#### **2.1.12. Servers must be secured in such a way as to ensure security, availability and reliability.**

Rationale:

- Servers must have UPS with a battery backup sufficient to meet the minimum up time as described by the data criticality.
- UPS should be capable of issuing a warning and optionally call via a page the responsible personnel.
- Access should be restricted to authorize personnel only.
- Must meet security policy standard.

### **2.2. Standards:**

#### **2.2.1. Utilize only open source operating systems that are commercially distributed and supported.**

Rationale:

- There are many open source Linux versions available that have not undergone a thorough testing process, and lack organized support. A commercially distributed version of Linux, such as Red Hat, SuSe, Caldera and others have been thoroughly tested and have organized support available twenty-four hours a day.

#### **2.2.2. Make sure server platforms are POSIX compliant.**

Rationale:

- POSIX is an IEEE standard design to facilitate application portability and interoperability. This facilitates movement of applications from one platform to another if needed.

#### **2.2.3. Ensure server platforms comply with third party certifications.**

Rationale:

- Third party certifications foster quality product purchases from manufacturers that have demonstrated abilities to deliver and support these products.

### 3. Technical Topic: Client

#### 3.1. Practices:

##### 3.1.1. Use open standards based host-controlled client platforms.

Rationale:

- Choose a device and host software that is already in use elsewhere in the enterprise. For example, the Department of Motor Vehicles is using PDF417 for 2-d bar codes. Unless significant business reasons exist for other choices, use the PDF417 coding standard.
- Consider other potential uses for the device and host software in the enterprise.

##### 3.1.2. When there is a conflict between end-user ease-of-use and ease of systems management, give priority to end-user needs.

Rationale:

- It would simplify systems management to standardize on a particular platform; however, application software is often available only for particular client platforms. Apple, for example, supplies software for education; Unix provides engineering packages, etc. Supporting the business needs of end users is most important.

##### 3.1.3. Minimize client operating system configuration variations to those that support business needs.

Rationale:

- Limiting the configuration variations will reduce maintenance time and associated costs.
- A client side operating system that has unnecessary services active increases the platform's risk to security vulnerabilities.

#### 3.2. Standards:

##### 3.2.1. Two-dimensional (2-d) bar codes should use PDF417 coding standard.

Rationale:

- The PDF417 bar code standard is used by the Department of Motor Vehicles. It is capable of storing data such as product information, maintenance schedule, shipping information for others.

##### 3.2.2. Utilize ISO 14443A and Mifare Smart Card standards for contactless smart cards.

Rationale:

- See Security and Network Domain for details.

##### 3.2.3. Avoid Proprietary smart card reader-side APIs.

Rationale:

- No standards exist for smart card reader-side APIs for application and platform integration. Use reader-side APIs from established platform vendors, such as PC/SC



for the windows environment or use APIs that strictly adhere to the ISO 7816/4 command set.

- See Security and Network standards for more details.